

**Notice of Allowability**

Application No.

09/997,396

Applicant(s)

HUJANEN ET AL.

Examiner

DAVID VU

Art Unit

2818

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 09/18/06.
2. ☒ The allowed claim(s) is/are 1-32, 46-50, 52 and 53.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f):
- a) ☐ All b) ☐ Some\* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),  
Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit  
of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413),  
Paper No./Mail Date 11/14/06.
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_.

  
DAVID VU  
PRIMARY EXAMINER

## DETAILED ACTION

### EXAMINER'S AMENDMENT

A. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Attorney Andrew N. Merickel on 11/14/06.

The applicant has been amended as follows:

1. (Currently Amended) A method of fabricating a magnetic memory cell, comprising:

providing a substrate on which the magnetic memory cell is formed;

depositing a first ferromagnetic layer;

depositing a dielectric layer over the first ferromagnetic layer; and

depositing a second ferromagnetic layer over the dielectric layer, wherein depositing at least one of the first or second ferromagnetic layers comprises:

depositing a metal oxide by multiple ALD cycles, wherein the metal oxide is not reduced to element metal in each ALD cycle; and

after completing the multiple ALD cycles, subsequently reducing the metal oxide to element metal.

14. (Currently Amended) A method of fabricating a magnetic memory cell, comprising:

providing a substrate on which the magnetic memory cell is formed;

depositing a first magnetic layer on the substrate;

forming a dielectric layer over the first magnetic layer;

depositing a metal oxide layer comprising a magnetic metal over the dielectric layer by multiple atomic layer deposition (ALD) cycles, wherein the metal oxide is not reduced to element metal in each ALD cycle; and

after completing the multiple ALD cycles, reducing the metal oxide layer to a magnetic elemental metal layer.

15. (Currently Amended) A method of fabricating a magnetic memory cell, comprising:

providing a substrate on which the magnetic memory cell is formed;

forming a first magnetic layer on the substrate;

depositing a first non-magnetic metal oxide layer over the first magnetic layer;

converting the first non-magnetic metal oxide layer to a first non-magnetic metal layer;

depositing an insulating layer on the first non-magnetic metal layer;

depositing a second non-magnetic metal oxide layer by multiple atomic layer deposition (ALD) cycles, wherein the metal oxide is not reduced to element metal in each ALD cycle;  
after the multiple ALD cycles, converting the second non-magnetic metal oxide layer to a second non-magnetic metal layer; and  
depositing a second magnetic layer on the second non-magnetic metal layer.

20. (Currently Amended) A method of fabricating a magnetic nanolaminate structure, comprising:

depositing a plurality of metal oxide layers on a substrate by multiple atomic layer deposition (ALD) cycles; wherein the metal oxide layers are not reduced to element metal in each ALD cycle; and wherein at least two of the metal oxide layers differ in composition; and  
after the multiple ALD cycles, subsequently converting at least one of the plurality of metal oxide layers to an elemental metal layers, wherein at least one of the metal oxide and elemental metal layers is magnetic.

33-45. Cancelled.

46. (Currently Amended) A method of fabricating a sensing element of a read-head comprising:

providing a substrate on which the sensing element is to be formed;  
depositing a first ferromagnetic layer by an atomic layer deposition (ALD) process  
comprising:

depositing a metal oxide by multiple ALD cycles, wherein the metal oxide is not reduced to elemental metal in each ALD cycle; and

after completing the multiple ALD cycles, subsequently reducing the metal oxide to elemental metal to form the first ferromagnetic layer;

depositing a conductive layer over the first ferromagnetic layer; and

depositing a second ferromagnetic layer over the conductive layer.

52. (Currently Amended) A method of fabricating a magnetic memory cell, comprising:

providing a substrate on which the magnetic memory cell is formed;

depositing a first magnetic layer;

depositing a dielectric layer over the first magnetic layer; and

depositing a second ferromagnetic layer over the dielectric layer, wherein depositing at least one of the first or second ferromagnetic layers comprises:

depositing a metal oxide by multiple ALD cycles, wherein the metal oxide is not reduced to elemental metal in each ALD cycle; and

after completing the multiple ALD cycles, subsequently reducing the metal oxide to elemental metal.

***Reason for allowance***

B. Claims 1-32 and 46-53 are allowed.

C. The following is an examiner's statement of reason for allowance:

The following is an examiner's statement of reason for allowance: the prior art of record, either singularly or in combination, does not disclose or suggest at least the claim limitations of "depositing a metal oxide by multiple ALD cycles, wherein the metal oxide is not reduced to elemental metal in each ALD cycle; and after completing the multiple ALD cycles, subsequently reducing the metal oxide to elemental metal", as instantly claimed and in combination with the additionally claimed method steps.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance".

### *Conclusion*

D. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Vu whose telephone number is (571) 272-1798. The examiner can normally be reached on Monday-Friday from 8:00am to 5:00pm. If attempt to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith S can be reached on (571) 272-1907. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR, Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR

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system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



DAVID VU  
PRIMARY EXAMINER